

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: MURPHY, Robert H. et al. Group Art Unit: 2622
Serial No. 10/521,031 Examiner: NGUYEN, L. T.
Filing or 371 (c) Date: 01/12/2005 Atty Dkt No. 20020001-US
For: FRONT LENS SHUTTER MOUNT FOR UNIFORMITY CORRECTION

To: Mail Stop Amendment
Commissioner for Patents
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PRE-APPEAL BRIEF REVIEW STATEMENT

This pre-appeal brief review statement accompanies a notice of appeal and a request for a pre-appeal brief review submitted herewith in accordance with the OG Notice of 12 July 2005.

Background

It is fundamental to the present invention that the claimed thermal imaging system is configured to form an image of detected infra-red radiation emitted by a black body scene. It is also fundamental that the thermal imaging system includes at least a shutter, a lens, and a focal plane array, or "FPA," and that the shutter is located between the black body scene and the lens, not between the lens and the FPA.

Black body infra-red imaging systems are able to image scenes in the absence of external illumination by detecting the "black body" infra-red radiation which all objects spontaneously emit in proportion to their temperature. A problem sometimes encountered in these systems is that the FPA's are so highly sensitive that under certain conditions they can detect not only black body radiation from the scene, but also black body radiation emitted by internal elements of the imaging system itself. This "internal flux" can distort thermal images of black body scenes. This can happen even if the internal elements are much cooler than the scene, because they much closer to the FPA. Note that the term "internal flux" as used in the specification is widely understood in the art to refer to this infra-red radiation generated by internal elements of the thermal imaging system, including the lens and the shutter.

At one time, it was typical to cool the internal elements of a thermal imaging system to cryogenic temperatures, so that the internal elements would not radiate enough infra-red energy

to significantly affect the thermal images. During this time period, a conventional wisdom was established that internal flux could be ignored. Due to structural and design considerations unrelated to internal flux, a conventional wisdom was also established that the shutter of a thermal imaging system should be located between the lens and the FPA.

Many years after the establishment of these conventional wisdoms, thermal imaging systems began to appear which were not cooled to cryogenic temperatures, and/or which included much more sensitive FPA's. As a result, infra-red internal flux became a cause of distortion in thermal images. However, due to the conventional wisdoms which continued to persist, this fact remained unrealized until the time of the present invention.

Given the benefit of hindsight, it may appear obvious that internal flux could cause image distortions under non-cryogenic conditions, and that these distortions could be removed by breaking with conventional wisdom and placing the shutter between the lens and the scene. This seemingly simple departure moves the shutter further from the FPA, thereby reducing its contribution to the internal flux, and also enables subtraction of all other sources of internal flux from scene images by taking a closed-shutter image of only the internal flux as a reference, and then subtracting the reference image from the open-shutter images. However, without the benefit of hindsight, this was not obvious. Conventional wisdom taught away from consideration of internal flux as a source of image distortion, and so this approach was not implemented for thermal imagers until the present invention.

Improper combination of incompatible references under 35 USC 103(a)

The office in this prosecution has failed in six separate office actions and two Examiner interviews to produce even one single prior art example of a thermal imaging system, (i.e. a system capable of imaging an infra-red black body scene), which broke with the conventional wisdom and placed the shutter between the scene and the lens, and not between the lens and the FPA. Instead, the office has persisted in rejecting the claims of the present invention based on "obvious" combinations of conventional thermal imaging systems (with shutters between the lens and the FPA) and reflected light cameras which image energy reflected from illuminated scenes.

While it may be tempting to assume that reflected light cameras are a closely related art to black body thermal imaging systems, this is not the case. The central problem addressed by the present invention is image distortion due to internal infra-red flux, and this problem does occur in reflected light cameras, because the reflected light imaged by such cameras is more intense by orders of magnitude than the internal flux. This is well known by those of average

skill in the art of black body thermal imagers. Therefore, someone of average skill in the art of black body thermal imagers would not have turned to the art of reflected light cameras so as to discover sources of image distortion and/or methods for eliminating distortions due to internal flux. And even if someone of average skill had turned to the art of reflected light cameras, he or she would not have found any teachings about internal flux in that art, and therefore he or she would have found no motive to combine the teachings of reflected light cameras with the teachings of the thermal imaging art so as to obtain the present invention, especially when such a combination was contrary to conventional wisdom.

In the most recent, final office action of 4/28/2010, the Office rejected all claims based on a combination of Lindgren (US 5,420,421) in view of Medina (US 5,081,530) and further in view of Bakhle (US 6,061,092). Lindgren teaches a black body thermal imaging system, but does not specify a location of a shutter. Medina states that his device will detect almost any wavelength of reflected light, as well as images formed using non-electromagnetic reflected energy such as ultrasound (col 1, lines 49-58). However, Medina is clearly limited to imaging reflected energy from scenes which are illuminated by an external source. See for example the abstract of Medina, which begins with the sentence: "A three dimensional camera system in which a precisely timed beam of energy is emitted from a single source with the beam illuminating the scene." Medina does not specify what sort of detector is used, and makes no statements regarding detecting very low levels of infra-red radiation, as would be detected by a black body thermal imaging system.

Medina is explicitly not concerned about where the shutter is located, because he is not concerned about internal flux. See Medina column 3, lines 66-68: "Shutter 24 is depicted in front of the lens 25, but could be placed behind it, or could be an integral part of the sensor 26." One of average skill reading Medina would therefore have concluded that the location of the shutter was irrelevant, and would have found no motive to depart from the conventional wisdom for black body thermal imagers which placed the shutter between the lens and the FPA.

Bakhle is directed to a video camera which detects reflected visible light, and so Bakhle is also directed to an art that is unrelated to the art of this invention. As with Medina, one of average skill would have had no motive to look to Bakhle for teachings relevant to artifacts in thermal images, and would have had no motive to combine the teachings of Bakhle with teachings of the thermal imaging art.

Claims History

Three independent claims are included in the application, wherein claim 1 is directed to a thermal imager and claims 10 and 15 to methods of obtaining thermal images. While the language of these independent claims has been amended in five separate office action responses, nothing of substance has been changed during prosecution of the application. Four of the office action responses and an examiner interview were required before it was finally agreed that the phrasology “black body scene” was sufficient to differentiate imaging of infra-red light emitted by an un-illuminated scene from imaging of reflected light from an illuminated scene. The fifth and most recent office action response attempted to more clearly state the independent claims by substituting the more specific expression “infra-red radiation emitted by the lens” in place of the more general term “internal radiant flux.” As discussed below, internal flux is well known in the art and is defined in the specification as being infra-red radiation emitted by elements internal to the imager (see for example paragraph [0035]). Since the lens is clearly described in the specification as being an internal element of the imager, this most recent amendment did not change the meaning of the independent claims, but only put them in more concrete and specific terms. Dependent claims 2, 3, 4, 8, 9, 11, 12, 13, 16, 21, and 22 have all been twice rejected without amendment.

Office incorrectly characterized Applicant’s directly relevant arguments as moot

In preparing his response of 1/27/2010, Applicant wished to make every effort to advance the prosecution. Due to comments made during a preceding Examiner interview, the Applicant specifically anticipated a possible rejection based on a combination of Lindgren with Medina. The Applicant therefore took pains in his response of 1/27/2010 to point out in detail why the teachings of reflected light cameras in general, and of Medina in particular, could not be combined with Lindgren as analogous art under 35 USC 103(a). Unfortunately, the Office chose to ignore the Applicant’s arguments regarding Lindgren and Medina, and to simply state that Applicant’s arguments were “moot in light of the new ground(s) of rejection.” This statement was at least ironic, because the “new grounds of rejection” were mainly the anticipated combination of Lindgren and Medina, with Bakhle only cited as teaching a signal processing module. Applicant’s arguments were, in fact, specifically directed to these grounds, and were therefore directly relevant, and certainly not “moot.”

Applicant notes that even when a rejection is based on newly cited references, chapter 707.07(f) of the MPEP (Examiner note under form paragraph 7.38) **requires** the office to “address any arguments presented by the applicant which are *still relevant* to any references being applied.” Applicant’s arguments directed to the anticipated combination of Lindgren and Medina were clearly “still relevant” to the “references being applied” (i.e. Lindgren and Medina, as anticipated), and were clearly not “moot in light of the new grounds of rejection.” Therefore,

the Office's decision not to address Applicant's arguments was clearly contrary to the requirements of MPEP 707.07(f). In making this decision, the Office failed to advance the prosecution, and placed the Applicant in a position where the only options were either to waste prosecution time by repeating arguments which had already been presented (and ignored), or to appeal.

Incorrect 35 USC 112 rejections

The Office has also rejected all claims under 35 USC 112, stating that the limitation of "infra-red radiation emitted by the lens" is not supported by the specification. However, the specification includes many statements which discuss detection of "internal flux" by the FPA. See for example paragraph [0015]. Internal flux is well understood in the art to be infra-red radiation emitted by elements internal to the imager. This meaning is also clear from the many statements regarding "internal flux" which are included in the specification. While the imager might include other internal elements, the only internal element other than the FPA which is specifically mentioned in the specification is the lens. See for example paragraph [0012]. Therefore, stating that the FPA detects infra-red radiation emitted by the lens is equivalent to stating that the FPA detects internal flux, which is well supported by the specification.

Applicant believes that the above statements clearly identify errors and omissions in the Office's rejections, as well as a general failure by the Office to advance the prosecution of this application. Applicant further believes that the application in its present form is in condition for allowance, and respectfully requests such action by the review board.

Respectfully submitted,

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